Land Research Program: Strategic Directions

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National Program Director

SAB Meeting
November 9-10, 2009

Program Purpose

- **Restoration**: to provide improved scientific knowledge and develop and apply more cost effective tools, models and methods to inform decisions on land restoration.
- **Preservation**: to provide improved scientific knowledge and develop and apply more cost effective tools, models and methods to manage material streams and, in collaboration with ecology and sustainability programs, to inform land use/reuse decisions.

Accomplishments

- Contaminated sediment research has provided techniques for food chain modeling of PCBs and evaluated remediation alternatives, including dredging effectiveness
- A Smart Energy Resources Guide is a key document supporting Green Remediation
- As a result of an arsenic fate, transport, and stability study for Fort Devens Superfund Site, the ORD team received a 2009 OSWER National Notable Achievement Award
- A new Environmental Technology Verification Center on material management and remediation is conducting technology evaluations
- Comparative toxicity studies of amphibole asbestos fibers supports Libby, MT remediation

Accomplishments

- Ground water research develops and applies various technologies to provide cost effective solutions for inorganic (including mining sites) and organic contaminants
- Vapor intrusion publications have addressed: the limitations of vapor intrusion models, sampling methods, and mitigation
- Underground Storage Tank research has developed treatment methods, models to support state guidance on MTBE and leveraged ethanol and gasoline plume models to support biofuels

Communication

- Released a Land Research Program web site epa.gov/ord/landscience
- Relevance of research:
  - Initiated an effort to document the uses and outcomes of research products and activities.
  - Partnerships with regional site managers have resulted in cost savings.
  - Research methods and models are used in guidance and site specific applications.
- Collaboration:
  - EPA members on review panels and annual meetings with NIEHS Superfund Research Program staff to increase relevance
  - EPA membership on SERDP workgroups and panels

Strategic Directions FY10-14

- Sediment remediation research will be leveraged with support from the Great Lakes Restoration Initiative (GLRI) to address exposure, effects, and remediation technology issues.
- An integrated cross-laboratory effort on bioavailability of metals is being initiated; co-investigators on 2009 SERDP award.
- Ground water remediation and technical support will continue to provide valuable contributions to EPA regions
- Green remediation and land use/reuse (e.g. Brownfields) are areas where ORD is discussing a cross program role.
- Developing closer linkages to Sustainability Program via biofuels and Life Cycle Assessment
- VI research will improve site characterization and management of sites through: field studies, improved subslab and soil gas sampling, the physics of gas flow, and the use of surrogate indicators

Anticipated Accomplishments FY10 - 14

- Leverage with GLRI sediment remediation field studies to produce products on: alternative technologies, bioaccumulation/food web tools, effectiveness of sediment remediation, sediment reuse, and technology validation.
- Report on the State of the Science for long-term stewardship of Permeable Reactive Barriers at hazardous waste sites.
- Synthesis document on ground water dense non-aqueous phase liquids (DNAPL) remediation technologies will be communicated to the regional forum.
- Publish reports on vapor intrusion modeling and engineering factors to determine approaches for screening and remediation.
- Demonstrate the long-term performance of passive treatment of mine waste contaminants of surface water.
- Publish a comparative toxicity report on effects of asbestos fibers.
- Studies on coal combustion residue (CCR) chemical/physical composition and leaching potential will support CCR draft regulations for OSWER.
- Publish an improved in-vitro method to measure arsenic bioavailability and a new method for arsenic speciation for OSWER Bioavailability Workgroup.

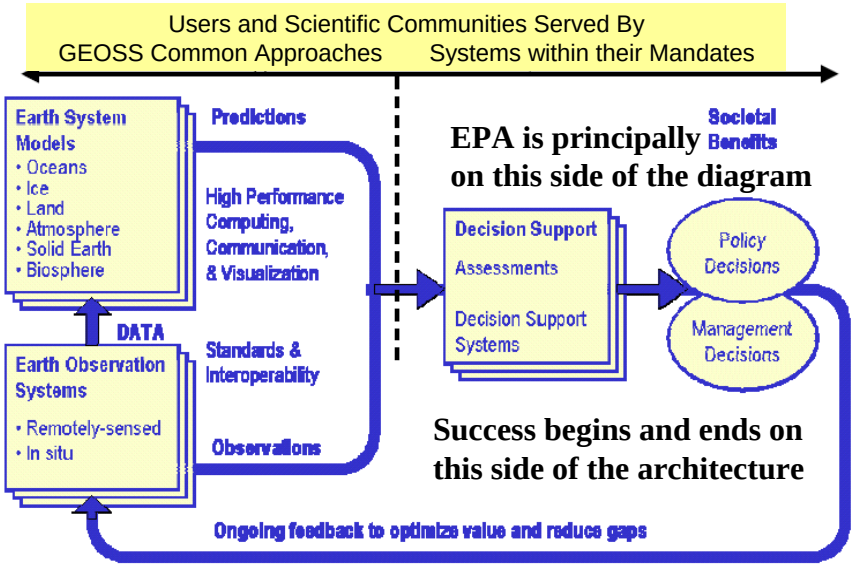
Global Earth Observation System of Systems (GEOSS) Advanced Monitoring Initiative

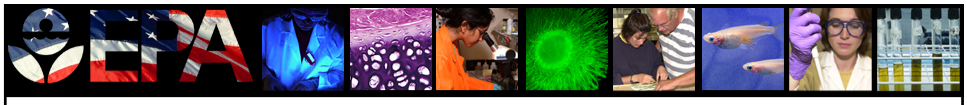
EPA Science Advisory Board Meeting
November 9-10, 2009

Background

- Earth observations provide the foundation for all environmental and climate decision-making and, therefore, represent a critical priority for the Administration.
- The purpose of GEOSS is to achieve **comprehensive, coordinated and sustained observations** of the Earth system, in order to improve monitoring of the state of the Earth, increase understanding of Earth processes, and enhance prediction of the behavior of the Earth system.
- The GEOSS architecture integrates environmental observation, monitoring data and measurements with modeling to support decision-making.
- GEOSS will meet the need for **high-quality, global, sustained information** on the state of the Earth as a basis for policy and decision-making, and will enhance delivery of benefits to society.
- **EPA's Group on Earth Observations (EPA GEO)** was established by the Agency's Science Policy Council in April 2005 to facilitate EPA's response and contribution to the development of GEOSS.
- **The Advanced Monitoring Initiative (AMI)** is an important part of GEOSS. AMI will bring the best monitoring data and information into environmental decision-making made by EPA and its partners.

The GEOSS Architecture





Recent Activities and Accomplishments

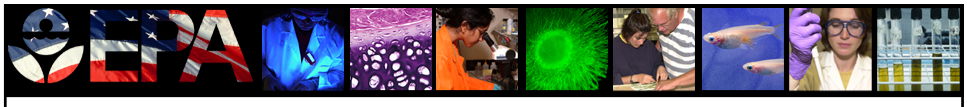
Air Quality

- New, more portable and standardized AIRNow software, enabling a more efficient U.S. system, sharing AIRNow data with GEOSS, and the first international deployment of AIRNow in Shanghai, China.
- An initial demonstration of the Air Model Evaluation Network, providing access to databases of models and observations supporting the work of the international Task Force on Hemispheric Transport of Air Pollution.
- Through the international GEO Architecture and Implementation Pilot and the Earth Science Information Partnership, catalyzing the development of air quality community catalogs and portals, which make GEOSS more usable and useful, and supporting the development of a community of air quality management professionals to guide the development of this infrastructure.
- Together, these efforts are beginning to form the backbone of an international air quality information network within the GEOSS framework.

Recent Activities and Accomplishments

Water Quality

- Traditional methods for aquatic integrity measurements are costly and lack quality. Demonstrated that DNA barcoding techniques could correctly identify several species of aquatic organisms with high precision and at competitive costs.
- Demonstrated the ability to use satellite products to monitor the distribution of Chlorophyll-a concentrations across the entire Albemarle-Pamlico Estuary system. This provides information about phytoplankton dynamics throughout the entire system and allows the detection of HAB events that may not be detected using traditional site-based monitoring techniques. This type of information could inform the TMDL process and be used to by state water monitoring managers to indicate where to temporarily deploy additional monitors.
- Virtual Beach Model Builder (i.e., four bacteria prediction models being used in the Great Lakes)



Recent Activities and Accomplishments

Biodiversity & Health

- Leveraged study on Lyme disease risk supported by CDC to integrate new Earth observations and field data on biodiversity to study the casual relationship between changes in biodiversity and risks of Lyme disease, and to refine a spatial map for the U.S.
- Jointly funded with OPP two new extramural grants under the sector Infectious Diseases IPM.
- *"Biodiversity loss impacts global disease ecology,"* published in *Bioscience.*
- Regional Science Workshop Biodiversity/Landscape Change and Lyme Disease: Science and Application: researchers shared science with decision-makers, and decision-makers shared science needs with researchers; Community of Practice was formed.
- Mosquito monitoring across a landscape gradient project with Smithsonian.
- Developing museum exhibit at the Smithsonian National Zoological Park on biodiversity and human health.

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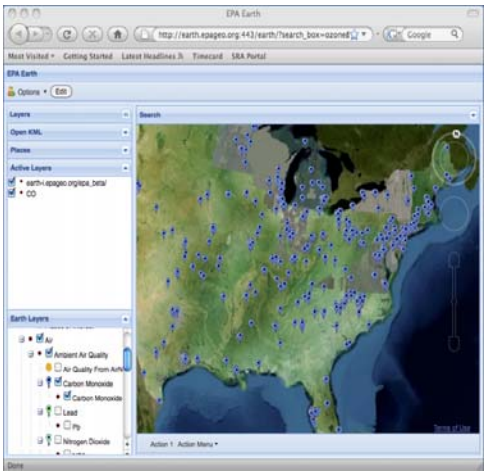
Recent Activities and Accomplishments

Transforming Data Management and Delivery



- EPA Earth is a Google Earth platform designed to view and analyze diverse types of environmental data and geospatial information from a wide variety of sources, including maps, databases, GPS units, remote sensors, aerial photos and radar. Information from this wide variety of sources can be mapped together to allow decision makers, scientists and other environmental professionals to easily find and use data and information they need.

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EPA Group on Earth Observations (EPA GEO)

Principles (SPC direction):

EPA GEO was created to support GEOSS and benefit from it. Its primary goal is to provide decision makers with scientific information that can advance societal benefit areas including health, climate change and air quality. The GEOSS architecture integrates environmental observation, monitoring data and measurements with modeling to support decision-making. In addition to transferring currently funded research to products and initiating new projects, EPA GEO's primary responsibility is to directly support the Agency's science priorities while leveraging capabilities across its program and regional offices, as well as partnering with States, other federal agencies and the international community. These efforts should guide the Agency to integrate monitoring and observational data, modeling results, technology, and decision tools.

Primary Activities to be Addressed by EPA GEO:

(1) Ensure a credible and transparent EPA GEO process and organization.

(2) Develop a set of EPA GEO strategic actions that further the development of GEOSS, support the SPC Science Priorities and benefit EPA's mission.

(3) Enhance cross-Agency communication and coordination of the activities of the EPA GEO.

(4) Enhance the accessibility and application of EPA Earth observation data and products.

(5) Partner with States, other federal agencies and the international community to advance monitoring and modeling technology and the development of decision tools for integrated problem solving.

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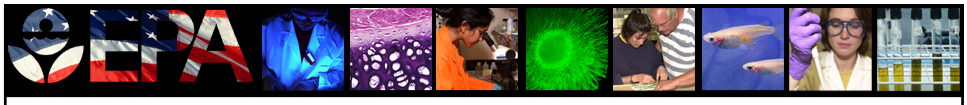
FY 2009 EPA GEO Accomplishments

- Reaffirmed EPA GEO Committee membership and transitioned EPA GEO Chair position to OSA. New membership and chairman started their terms in June 2009.
- Revised EPA GEO Committee charter, incorporating SPC recommendations.
- Worked to improve the structure of the EPA GEO organization and ensure openness and transparency.
- Worked with EPA GEO members to ensure a credible and transparent process for FY09 AMI project selection based on four strategic theme areas developed in 2008 (Air Quality, Water Quality, Data and Information Infrastructure, and Integrated Media).



GEOSS FY 2010 Goals

- Developing expanded or new AMI Strategic Themes for FY 2010/2011 that support the SPC Science Priorities and the EPA and GEO Strategic Plans.
- Participating in the GEO-VI Plenary, hosted by the United States, and related side events.
- Formalizing the AMI/GEOSS project selection process to ensure transparency and scientific integrity.
- Complete the AIRNow project in Shanghai.
- Sign MOUs between EPA-NASA and EPA-NSF.
- Engaging the Regions and Offices in AMI supported integrated monitoring activities that may also involve modeling and technology.
- Partner with ESIP to form a Water Quality Cluster to enhance WQ-GEOSS work at EPA.
- Prepare to showcase EPA GEOSS at the 2010 GEO Summit in China.

For More Information

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Homeland Security Research Program: Strategic Directions

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EPA Homeland Security Drivers and Responsibilities

Drivers

Bioterrorism Act (2002)

Homeland Security Presidential Directives (2003-2008)

National Response Framework (revised 2008)

Elements of:

- Comprehensive Environmental Response, Compensation and Liability Act
- Emergency Planning and Community Right-to-Know Act
- Clean Water Act
- Safe Drinking Water Act
- Oil Pollution Act
- Clean Air Act

Responsibilities

- **Protect water systems from attacks and for detecting and recovering from successful attacks** affecting water systems by leading efforts to provide States and water utilities guidance, tools and strategies. *EPA is the federal government Sector Specific Agency (SSA) lead for water infrastructure.*
- **Decontaminate buildings and outdoor areas** impacted by a terrorist attack by leading efforts to establish clearance goals and clean up.
- **Develop a nationwide laboratory network** with the capability and capacity to analyze for chemical, biological and radiological agents for routine monitoring and in response to a terrorist attacks.

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HS Research Program Mission

To conduct research and develop scientific products that improve the capablity of the Agency to carry out its homeland security responsibilities

Clients of the HS Research Program

Primary Clients

EPA Office of Water

responsible for carrying out water sector-specific lead agency duties

EPA Office of Solid Waste and Emergency Response

broad responsibilities in response to indoor and outdoor areas incidents of national significance

Other important stakeholders

EPA Office of Homeland Security

EPA Regions

EPA Office of Prevention, Pesticides and Toxic Substances

EPA Office of Air and Radiation

States and local authorities

Water utilities

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Homeland Security Research Program
Long Term Goals

Long Term Goal 1: The Office of Water, water utilities and other clients use homeland security research program products and expertise to improve protection from and the capability to respond to terrorist attacks on the nation's water and wastewater infrastructure.

Long Term Goal 2: The Office of Solid Waste and Emergency Response and other clients use homeland security research program products and expertise to improve the capability to respond to terrorist attacks affecting buildings and the outdoor environment.

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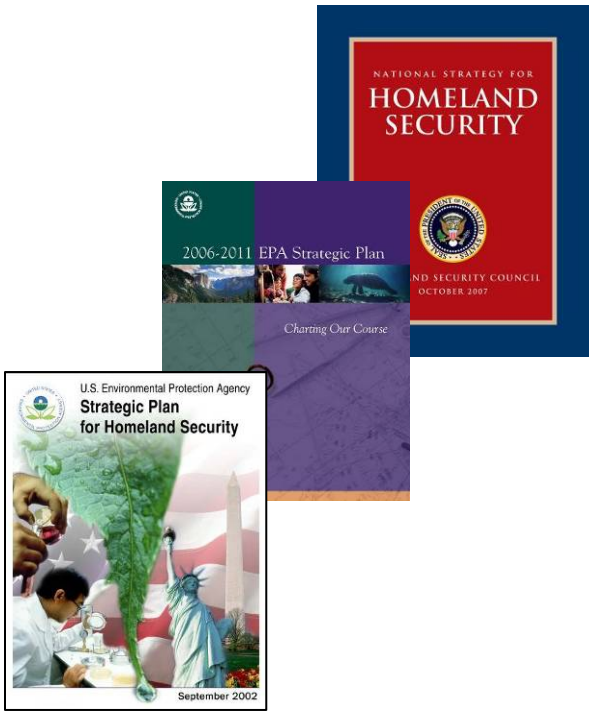
Homeland Security Research

Establishing Strategic Directions



- Strategic plans
  - National Homeland Security Strategy
  - EPA Strategic Plan
  - EPA Homeland Security Strategy
- Administration priorities
- DHS threat analyses
- Client needs
- External expert advice
  - SAB
  - BOSC (May 2008): *"The general quality of the research being conducted is quite high and directed by a well organized MYP. "*
  - National Research Council

EPA Responsibilities Responding to Terror Events and Corresponding Research Themes

Event Chronology	**Water Infrastructure** To provide the EPA response community and water/wastewater utilities guidance, methods and tools so that they may effectively:	**Outdoor and Indoor Areas** To provide the EPA response community guidance, methods and tools so that they may effectively:
Protect against attacks	√	
↓		
Monitor, detect, and confirm CBR attack	√	
↓		
Minimize exposure of the public to the contamination	√	√
↓		
Characterize the nature and extent of contamination	√	√
↓		
Assess the risk to human health and establish cleanup goals	√	√
↓		
Clean up the site	√	√

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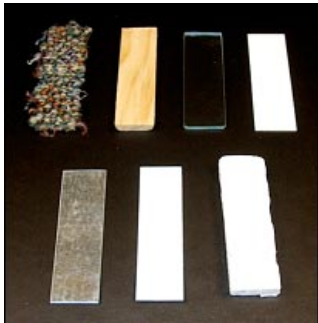
Recent major program accomplishments

- **Developed Provisional Advisory Levels** (PALs) for exposure to over 30 high priority hazardous chemicals and chemical warfare agents in air and drinking water.
- **Sixteen Instruments Tested** to Determine Their Capability to Screen Samples Submitted to All Hazards Receipt Facilities prior to a full analysis, helping protect responders, workers, and others from potential injury. AHRFs were developed to prescreen for chemical, radiochemical, and explosive hazards in samples collected during suspected terrorist attacks.
- Chosen as one of six international finalists vying for the 2008 prestigious **Franz Edelman Award** for work on modeling and distribution systems, “Reducing Security Risks in American Drinking Water Systems.”
- **Developed and licensed a ultrafiltration-based concentrator** for microbial water samples to support rapid microbial analysis and licensed the technology to a private company for marketing.
- **Determined the efficacy of decontaminating** toxic industrial chemicals and chemical warfare agents on building materials using chlorine dioxide fumigant and liquid oxidants



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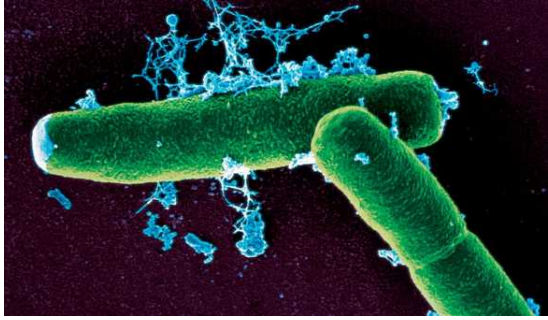

2010 – 2014 Strategic Directions

Based on needs and guidance from the White House Homeland Security Council, our primary clients, SAB and NAS, the major strategic direction identified and to be addressed include:

- **Responding to a wide-area anthrax attack** – dose-response, clean up goals, sampling and analytical methods, risk assessment and communication, and clean up strategies
- **Responding to the detonation of a radiological dispersion device** (RDD) – sampling and analytical methods, and clean up strategies
- **Responding to an attack on a water distribution system** – modeling tools to contain the spread of contamination and locate the source, risk assessment and communication, decontamination of infrastructure, and treatment of contaminated water
- **Developing sampling and analytical methods** for chemical, biological and radiological materials that may be used as weapons of mass destruction.

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Anticipated, near-term major program accomplishments

- Strategies to decontaminate water infrastructure when intentionally contaminated with chemical, biological or radiological materials
- A non-zero, risk-based cleanup goal for anthrax
- Development and testing of decontamination methods to address wide-area anthrax and radiological contamination
- Verified and validated analytical methods for chemical warfare and biological agents (esp. anthrax) in water, air and on surfaces (in collaboration with OSWER and OW).
- Increased understanding of how to communicate risk and risk management decisions to the public.
- Publication of the HS Research Multi-Year Plan

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Relationship to other Programs

- ORD research closest relatives
  - **Drinking Water Research Program**
  - Land Research Program
  - Human Health Risk Assessment Research Program
- Interagency research coordination
  - **DoD** and **DHS** science and technology programs via “Tri-Agency workgroup” and several MOUs
  - **CDC** collaboration on microbial risk assessment
- Others
  - Water Research Foundation
  - Water Environment Research Foundation
  - International collaborations (UK, Australia, Russia)